Earth Systems Science OPeNDAP Compute Server Framework

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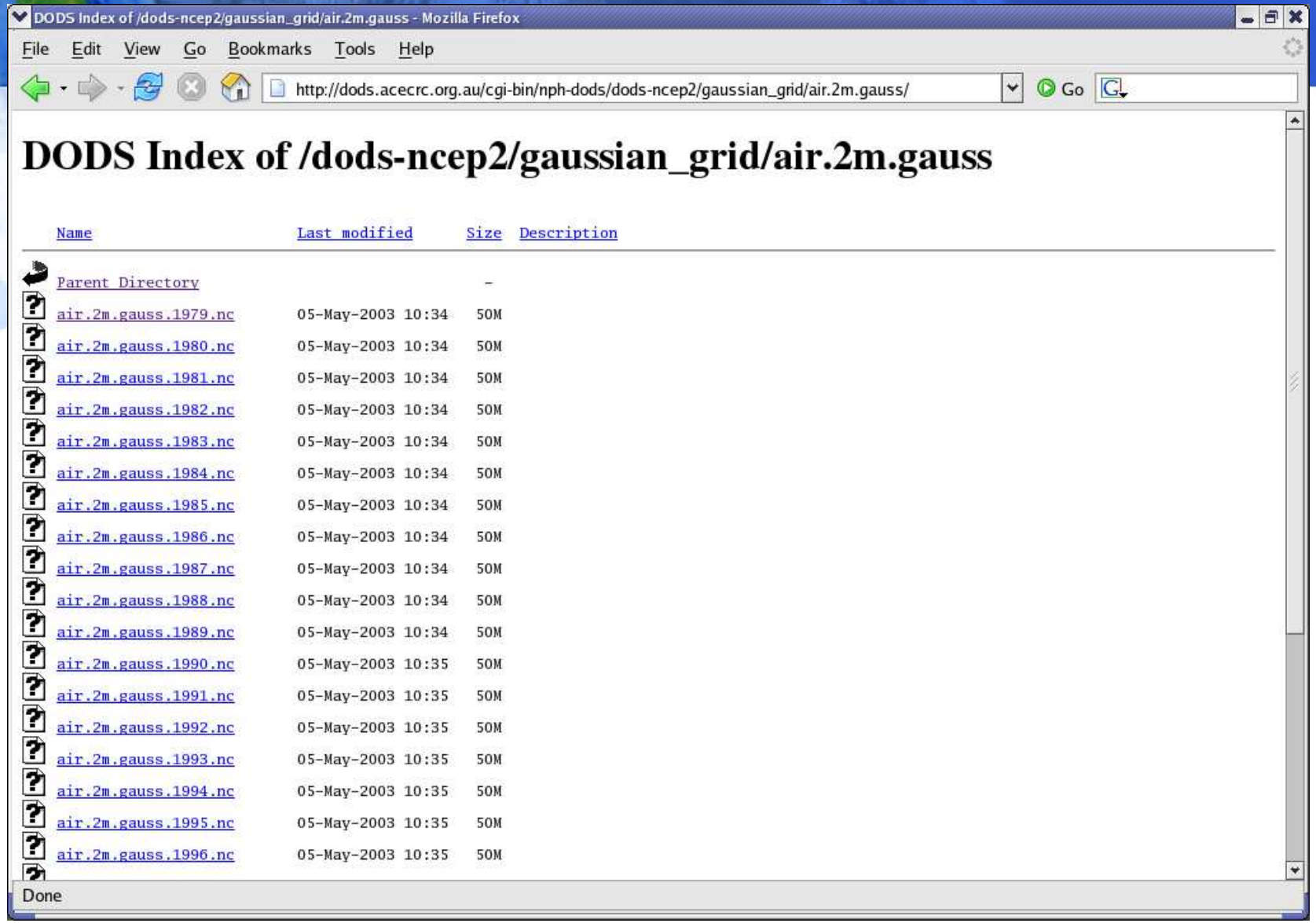
What is OPeNDAP?

- Enables seamless access to remote datasets
- Client/server model, with many different clients available
- URLs used to access datasets, with the data delivered via HTTP
- Data translation facility - original data may be stored in a wide variety of formats (netCDF, JGOFS, HDF...)
- Sub-sampling capabilities


DODS Index of /dods-ncep2/gaussian_grid/air.2m.gauss - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://dods.acecrc.org.au/cgi-bin/nph-dods/dods-ncep2/gaussian_grid/air.2m.gauss/
Go
DODS Index of /dods-ncep2/gaussian_grid/air.2m.gauss
Name Last modified Size Description
Parent Directory -
air.2m.gauss.1979.nc 05-May-2003 10:34 50M
air.2m.gauss.1980.nc 05-May-2003 10:34 50M
air.2m.gauss.1981.nc 05-May-2003 10:34 50M
air.2m.gauss.1982.nc 05-May-2003 10:34 50M
air.2m.gauss.1983.nc 05-May-2003 10:34 50M
air.2m.gauss.1984.nc 05-May-2003 10:34 50M
air.2m.gauss.1985.nc 05-May-2003 10:34 50M
air.2m.gauss.1986.nc 05-May-2003 10:34 50M
air.2m.gauss.1987.nc 05-May-2003 10:34 50M
air.2m.gauss.1988.nc 05-May-2003 10:34 50M
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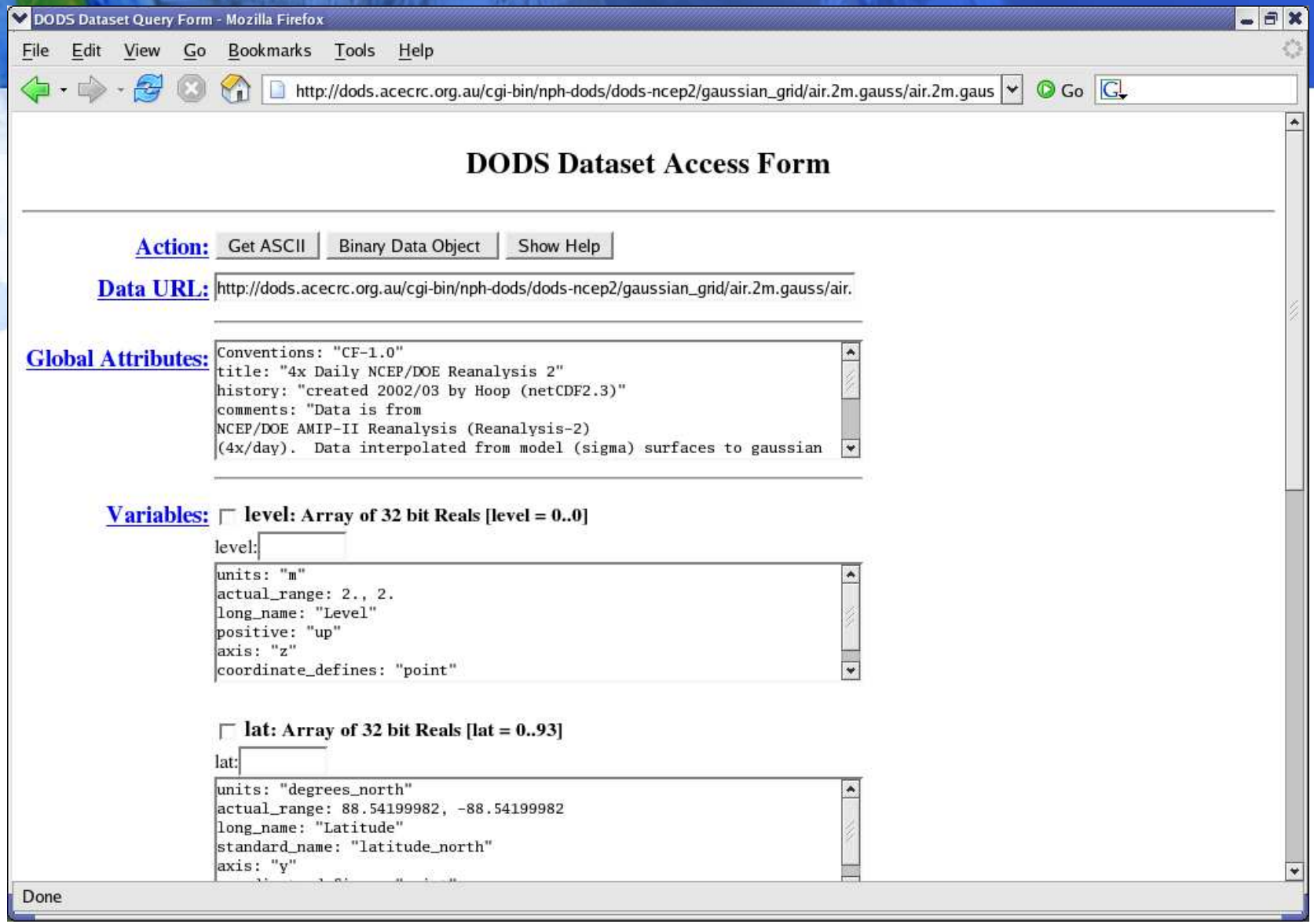
air.2m.gauss.1996.nc 05-May-2003 10:35 50M
Done


DODS Dataset Query Form - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://dods.acecrc.org.au/cgi-bin/nph-dods/dods-ncep2/gaussian_grid/air.2m.gauss/air.2m.gaus
Go
DODS Dataset Access Form
Action:
Get ASCII
Binary Data Object
Show Help
Data URL:
http://dods.acecrc.org.au/cgi-bin/nph-dods/dods-ncep2/gaussian_grid/air.2m.gauss/air.
Global Attributes:
Conventions: "CF-1.0"
title: "4x Daily NCEP/DOE Reanalysis 2"
history: "created 2002/03 by Hoop (netCDF2.3)"
comments: "Data is from
NCEP/DOE AMIP-II Reanalysis (Reanalysis-2)
(4x/day). Data interpolated from model (sigma) surfaces to gaussian
Variables:
level: Array of 32 bit Reals [level = 0..0]
level:
units: "m"
actual_range: 2., 2.
long_name: "Level"
positive: "up"
axis: "z"
coordinate_defines: "point"
lat: Array of 32 bit Reals [lat = 0..93]
lat:
units: "degrees_north"
actual_range: 88.54199982, -88.54199982
long_name: "Latitude"
standard_name: "latitude_north"
axis: "y"
Done

The limitations of OPeNDAP

- Only allows sub-sampling - no other server-side manipulation of the data is possible
- Only allows references to single files

Extending OPeNDAP

- Use existing applications (Ferret, GrADS, IDL, Matlab, NCO...) to carry out server-side processing of the data
- Enables a wide range of operations to be performed on the data - arithmetic operations, averaging, calculating EOFs...
- Requires the OPeNDAP URL format to be expanded
- Requires only a trivial modification to existing OPeNDAP installations - just replace a few Perl modules

Expanding the OPeNDAP URL format

- Conventional OPeNDAP request:

```
http://dods.acecrc.org.au/cgi-bin/nph-dods/
air.2m.gauss.1979.nc.dods?air[0:1:1459][0:1:93][0:1:191]
```

- Now calculate the average along the time axis:

```
http://dods.acecrc.org.au/cgi-bin/nph-dods/
air.2m.gauss.1979.nc.dods?air[0:1:1459@ave][0:1:93][0:1:191]
```

Expanding the OPeNDAP URL format

- Calculate the average over multiple files:

```
http://dods.acecrc.org.au/cgi-bin/nph-dods/
_calc_average(inputs:air.2m.gauss.197?.nc)
(params:input_var=air,output_var=average_air).dods?
average_air[0:1:1459][0:1:93][0:1:191]
```

- Calculate the EOFs:

```
http://dods.acecrc.org.au/cgi-bin/nph-dods/
_calc_eofs(inputs:air.2m.gauss.197?.nc)
(params:input_var=air,output_var=air_eof,tol=0.001).dods
```

Further developments

- Web processing service:
  - Asynchronous results delivery
  - Progress monitoring
  - Remote data input
- Web compute service:
  - Use JSDL (Job Submission Description Language) to specify resource requirements
  - Stage user data